FURTHER STUDIES ON BRISKET DISEASE

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INTRODUCTION

A previous publication[1] of this Station presented a preliminary report of a peculiar dropsical condition found among cattle in the mountains of Colorado which the stockmen call "brisket disease." Some of the more technical studies made previous to the publication of that report were purposely omitted from it, but are given here, with the addition of such observations as we have been able to make since that time.

Altogether we have studied 45 cases, more or less completely, which form the basis of this paper. Reports from New Mexico and Wyoming indicate the existence of disease in that part of this country, but we have never been able to definitely locate it in the high altitudes of any other country. Dr. E. Hess, cattle pathologist, of Berne, Switzerland, informs us that he knows nothing of the disease in that country.

CONDITION OF HEART

The heart, being suspected early as the organ at fault, came in for a considerable share of attention. As stated in a former publication, it is usually very large, flabby, and rather misshapen. Plate 28, B, shows a normal and a diseased heart from two 4-months old calves of approximately the same weight. The normal heart weighed 1½ pounds, while the one from the calf dead of brisket disease weighed 3¼ pounds.

Being anxious to determine whether the hearts of animals raised at high altitudes actually weighed more than those at sea level, a series of hearts were weighed at three packing centers: Denver, Colorado; San Francisco, California; and Fort Worth, Texas. The weighings at Denver were made by Dr. E. W. Alkire, those at San Francisco by Dr. E. A. Meyer, and those at Fort Worth by Dr. O. W. Seher, the two last-named being veterinary inspectors of the Bureau of Animal Industry. Special instructions were given the men so that the trimming might be done in the same manner, and it is believed the results are properly comparable. The hearts were split in such a way that the four cavities were laid open and the vessels were trimmed close to the organ. In most instances a portion of the top of the left auricle was removed. The results of these weighings are given in Table I. It is not considered necessary to give in detail the other characters of the disease, except to say that the animals show generalized edema and enlarged and sclerozed livers such as would be expected in cardiac weakness (Pl. 28, A; 29; 30).

[1] Glover, G. H., and Newsom I. E. BRISKET DISEASE (DROPSY OF HIGH ALTITUDES). Colo. Agr. Exp. Sta. Bul. 204, 24 p., illus. 1915.

TABLE I.—*Results of weighings of the hearts and carcasses of cattle at Denver, San Francisco, and Fort Worth*

Lot No.	Killed at—	Raised at—	Altitude.		Number of animals.	Sex.	Weight of carcass.			Weight of heart.			Average weight per 1,000 pounds of carcass.
			Summer.	Winter.			Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	
			Feet.	*Feet.*			*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1	Denver	Gunnison, Colo.	9,000 to 10,000	8,000	123	Female	713	406	554	6.375	3	4.359	7.985
[a] 2	do	Whitewater	9,000	6,000	4	do	599	464	502	6.500	4.500	5.625	10.807
3	do	Carbondale	8,500 to 9,000	6,700	39	Steers	771	485	603	6.250	3.500	4.413	7.321
4	do	do	Above 8,000		7	Female	726	487	600	5.625	4.125	4.929	8.213
5	do	Pagosa Springs	do		38	do	734	462	551	5.625	3.500	4.270	7.750
6	do	Carbondale, Colo., 16 Rifle, Colo., 1	do		17	do	594	393	518	5.000	3.875	4.353	8.402
[a] 7	do	Falcon, Colo	6,800	6,800	9	Cows	756	492	551	3.875	3.125	3.561	6.501
8	San Francisco		300	300	55	Steers			669	5.688	3.375	4.590	6.726
9	do		300	300	41	do	753	485	611	5.375	3.500	4.290	7.021
10	Fort Worth	Blessing, Tex	44	44	42	do	412	308	349	3.500	1.750	2.500	7.163
	Total, or average high altitudes: 1, 3, 4, 5, 6, Denver				224				561			4.371	7.791
	Total, or average low altitudes: 8, 9, 10, San Francisco and Fort Worth				138				554			3.829	6.912
	Difference in favor of high-altitude animals											.542	.879

[a] Not counted in the summary.

Lots 2 and 7 were not included in the summary for the following reasons:

Lot 2 consisted of only four animals, of which No. 1 had a carcass weight of 539 pounds, with a heart weight of 6.5 pounds. The heart was clearly pathological; therefore it was not thought proper to include the lot.

Lot 7 included 9 cows from Falcon, Colo. This lot is of some interest because the hearts averaged lower than either those from San Francisco or Fort Worth, but since the animals were neither from an extremely high nor a very low altitude they were not included in the summary.

It will be seen from Table I that heart weighings were made on 224 cattle raised at high altitudes and 138 raised near sea level. The animals from high altitudes averaged 9 pounds heavier in carcass weight and had hearts averaging 0.542 pound heavier. On the basis of 1,000 pounds of carcass weight, the only proper one for comparison, there was a difference of 0.879 pound in favor of the animals from high altitudes. This number of weighings is probably too few on which to base a conclusion, but the results seem to be in accord with the observations of others made on the subject, and also with what one may reasonably expect, that these animals have heavier hearts than those raised near sea level.

Heger and Meyer, working with guinea pigs and rabbits kept at known air pressures, found the weights of the hearts as shown in Table II.

TABLE II.—*Weights of hearts of guinea pigs and rabbits, according to Heger and Meyer*

Animal.	Air pressure.	Average weight of animals.	Average weight of heart.	Weight of heart per 1,000 gm. of body weight.
	Mm.	*Gm.*	*Gm.*	*Gm.*
21 guinea pigs	765	529	3.88	7.334
	580	448	3.85	8.594
	500	445	3.42	7.686
15 rabbits	765	892	4.92	5.528
	500	870	5.76	6.620
	217	1,224	9.75	7.965

They conclude in the following language:

From the experiment it appears that the thinning of the air had the effect of increasing the weight of the lungs and heart, which was especially true of the rabbit. The increase of weight is, in several cases, considerably more for the heart than the lungs.

EFFECT OF FEED ON BRISKET DISEASE

In order to determine whether the feed or anything in it was the causative factor in the brisket disease, several animals were shipped to the Colorado Experiment Station, where they were fed on hay that had been raised in the high altitude of the South Park district. This hay was of the typical South Park wire-grass, and was obtained from a Den-

ver firm, who informed us that it came from that district. The animals shipped for this determination received no treatment other than ordinary care and got no other food than the hay. Abundant water was given.

Following is a detailed account of these cases:

CASE 33.—Red heifer, 1 year old; raised at Jefferson, Colo., altitude 9,500 feet; arrived at Fort Collins on January 13, 1915. Was very dull, listless; the brisket was somewhat swollen; the abdomen was greatly distended; diarrhea profuse; irregular and rapid heart; respiration rapid and difficult, with grunting. An occasional moist cough was noticed.

She was hauled to the Station stables and given South Park hay and water. She ate not to exceed 5 pounds of hay during the next seven days, her appetite being practically gone (Pl. 28, C). She gradually grew worse and died on January 21. The postmortem examination revealed typical lesions of brisket disease.

CASE 34.—A calf 6 weeks old was shipped on February 13, 1915, by express from Jefferson, Colo., altitude 9,500 feet, arriving at Fort Collins on the 14th. He was in a moribund state on arrival and died on the night of the 14th without eating anything after being delivered at the Station.

CASE 35.—Red-and-white male calf, 6 months old, shipped on March 22, 1915, by express from Woodland Park, Colo., altitude 9,000 feet. The calf had been ill for two weeks previous to shipping. The owner had lost four others with the same trouble. On arrival at the Station he was thin in flesh, and weak but not dull; the brisket was slightly swollen, and the abdomen was enlarged. His appetite was good, and the feces were normal. On South Park hay and water he gradually improved, so that on the 27th the brisket became normal and on the 29th the abdomen had returned to usual size. In all respects the calf was normal, except that he was thin in flesh. He was kept under observation for two or three months, became fat, and finally was sold.

CASE 38.—A 4-months-old heifer calf; shipped from Jefferson, Colo., and arrived at Fort Collins on October 3, 1915. She had a rather severe diarrhea, but there was no swelling of the brisket and not much enlargement of the abdomen. She was placed on South Park hay, but, as she would not eat it, alfalfa was substituted for two days, after which she was given the South Park forage. Diarrhea continued for six days, when the feces became normal, and the calf improved so that she was sold on November 2, 1915, in good condition.

CASE 39.—Hereford heifer, 6 months old, shipped to Denver from Jefferson, Colo., and arrived at the former place on October 11. When seen on that day, she was very dull, the brisket were badly swollen, and she was grunting with each breath. Her appetite, however, was good. She remained in Denver until the 18th, when she was shipped to Fort Collins, arriving there on the 19th. The brisket was still swollen, although much reduced. She was placed on the South Park hay and continued to improve, so that on October 23 the swelling had entirely disappeared. She became normal and was sold on November 2.

CASE 40.—Yearling Shorthorn steer; shipped to Denver with the preceding case. Quite thin; had diarrhea, but no swelling of brisket. Arrived in Fort Collins on the 19th, was placed on South Park hay, improved rapidly, and was sold in normal condition on November 2.

CASE 41.—A 2-year-old Hereford steer; shipped with cases 39 and 40 and treated in the same manner. This steer was very thin, had a diarrhea, and was scouring badly. He gradually improved on the South Park hay, but did not put on much flesh until spring. He gained in strength, and the scouring stopped at about the tenth day after arrival at the Station. In March he was sent to pasture, and there died of tympanites on March 29.

These six cases were fed the high-altitude South Park hay in order to determine whether the feed was a factor. The first two animals died without eating enough of the hay to determine its effect, but the other four improved and finally recovered on it. Therefore, we are led to believe that the change of altitude and not the change in feed is the essential factor in the recovery of animals from this disease on being shipped to the lower levels.

SUMMARY

Our observations tend to show that normal animals living in a high altitude have a heavier heart than those living near sea level; that animals affected with brisket disease had dilated, flabby, and heavy hearts; that they have a high percentage of red corpuscles; that they show generalized edema and enlarged and sclerosed livers, such as one would expect in cardiac weakness; that they usually recover when shipped to lower altitudes, but seldom do if they remain at the higher levels; and that the feed is not a factor; that animals from low altitudes are more often affected than natives; that calves sired by bulls from low altitudes are more likely to be affected than those sired by native bulls; that the higher the altitude the more prevalent is the disease.

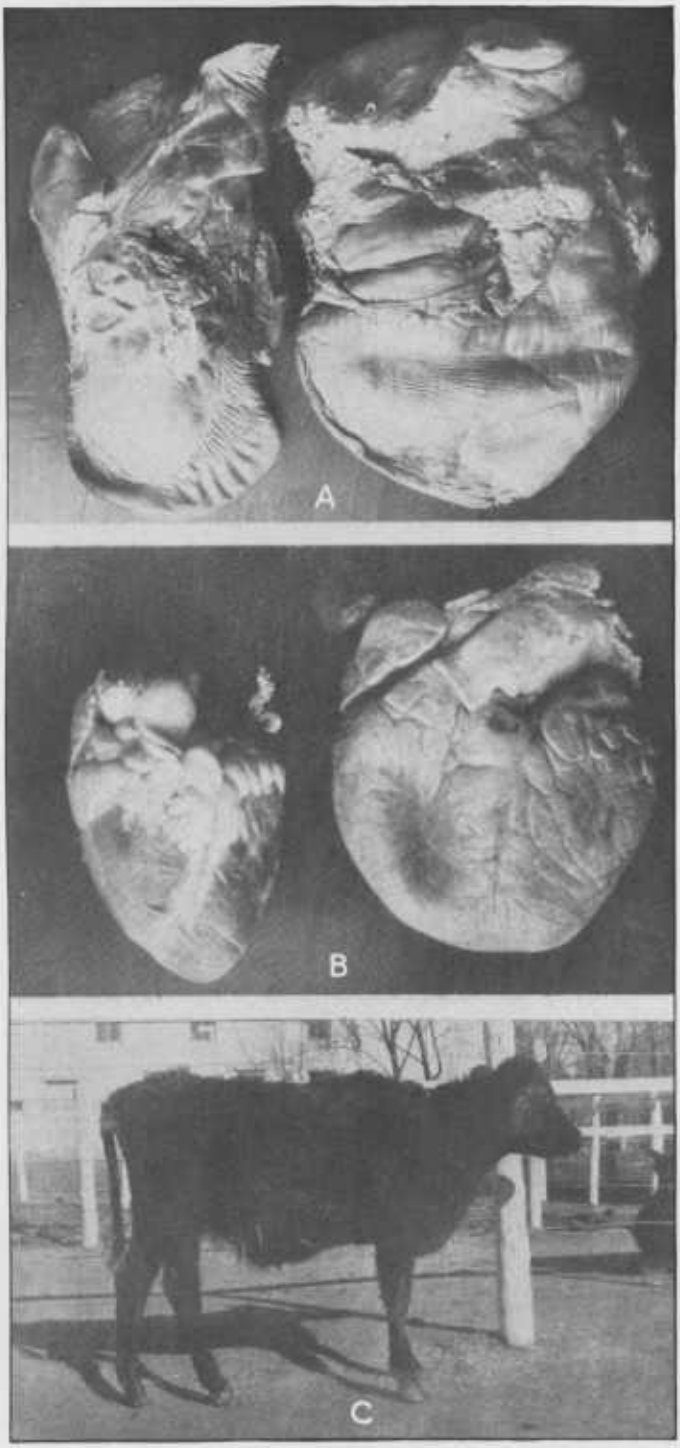
We therefore have no hesitancy in concluding that the malady is due to failure of acclimatization at high altitudes. The remedy lies not in drugs, but in breeding a hardier strain of cattle which can accustom themselves to the rigorous conditions incident to an existence at these extreme altitudes.

PLATE 28

A.—Livers of normal calf and one affected with brisket disease. Same age. Normal liver weighed 4¼ pounds, the diseased 10 pounds.

B.—Hearts of normal animal and one that died of brisket disease. Same age. The normal weighed 1½ pounds, the diseased 3¼ pounds.

C.—Case 33, a heifer showing the characteristic symptoms of the brisket disease.


A
B
C

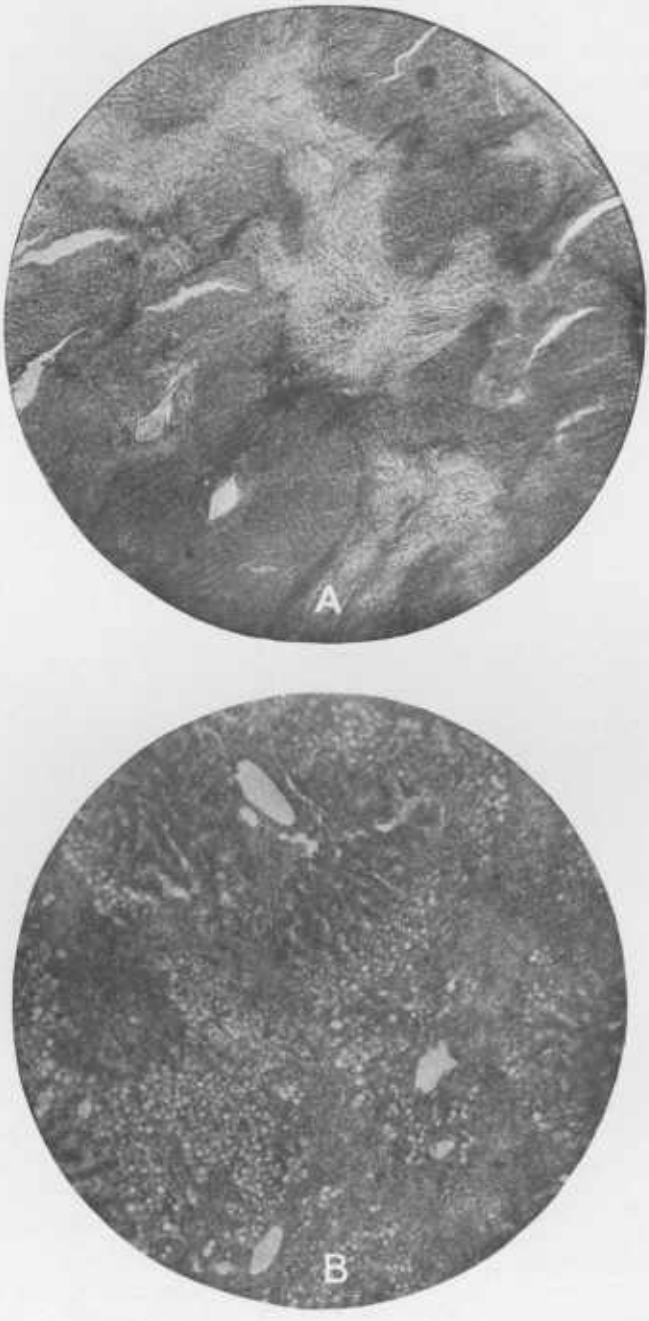

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PLATE 29

A.—Interlobular connective tissue in the liver of an animal dead of brisket disease. The excessive weight and toughness of these livers seem to be referable to a new formation of fibrous tissue.

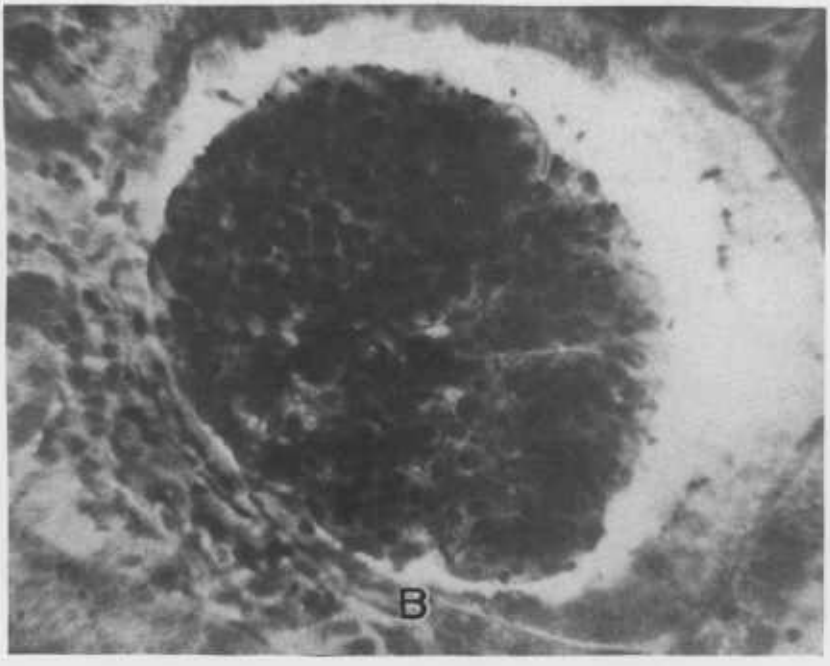
B.—Fatty accumulation in the liver in early stage of brisket disease.

PLATE 30

A.—Edema around one of the arterioles in the kidney.

B.—Malpighian body in the kidney of an animal dead of brisket disease. Note that Bowman's capsule is dilated and filled with detritus.


A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